

ELECTRO-OPTICS AT INFRARED INDUSTRIES, INC.



Partnership in space...another IRI package on its way



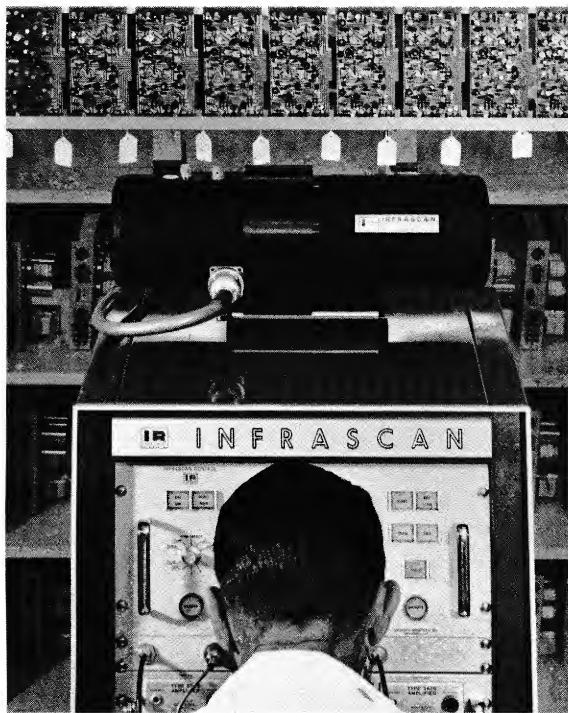
IRI THERMODOT® radiometers for process control

The science and technology of electro-optics —the conversion of optical energy to electronic energy (and the reverse process)—is the primary business of Infrared Industries, Inc.

IRI's self-contained capability in electro-optics embraces classical optics, electronics, electro-mechanics, and photoconductivity. This singular concentration of disciplines and facilities enables us to provide maximum control and accept complete responsibility for project design and manufacture.

We have used these capabilities to produce radiometric systems for the exploration of space, complex electro-optical calibration systems, industrial process controls, medical diagnostic equipment and missile guidance sub-systems and components.

Radiometry, the science of the detection and measurement of radiant energy, is basic to much



IRI INFRASCAN® radiometers for quality assurance



IRI THERMOSCAN® radiometers for medical research

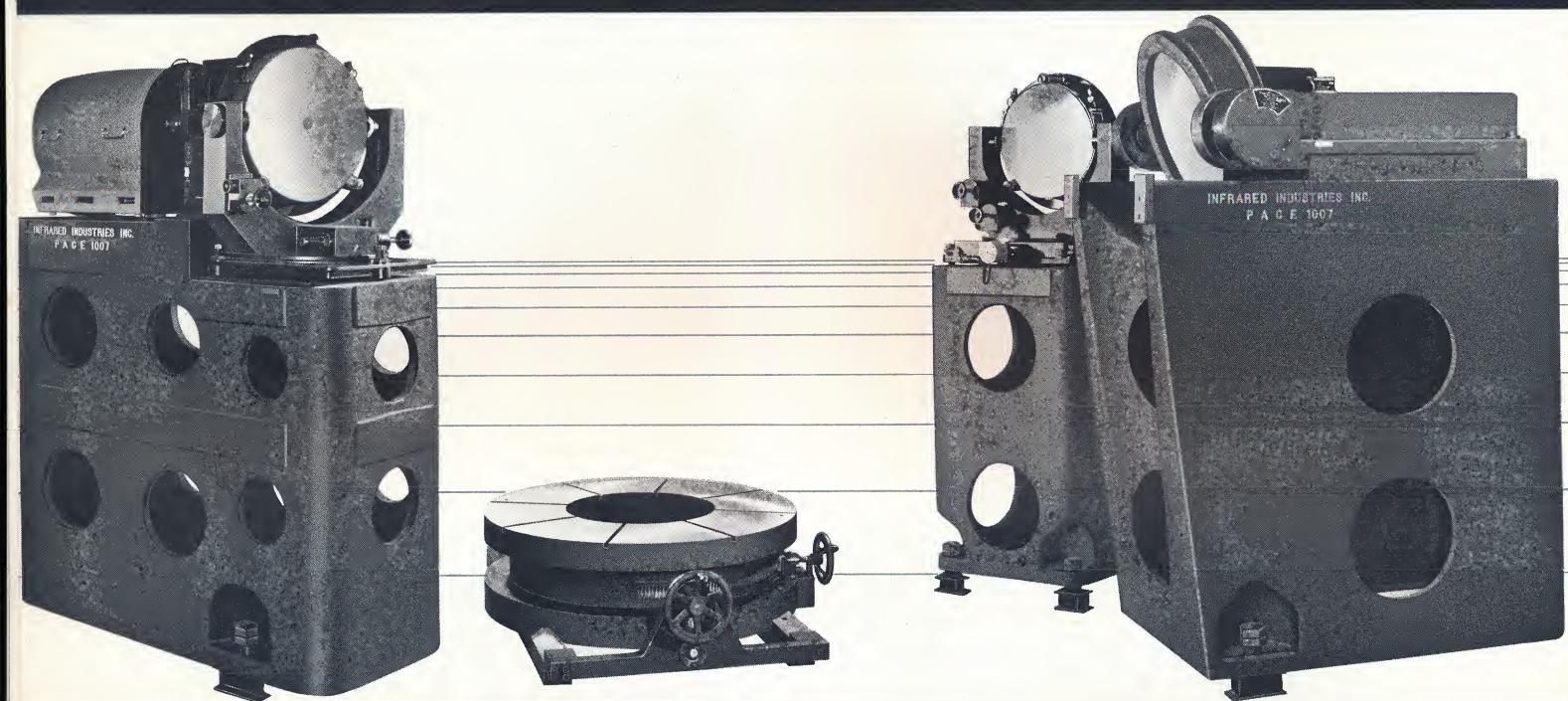
of Infrared Industries' work in electro-optics. IRI has designed and manufactures a comprehensive line of radiometers and all of the critical (major) components of these units which control, direct, sense, and measure radiation, are manufactured by the company.

For industrial processes where temperature is an important parameter—and it usually is—IRI's Thermodot® remote, non-contact temperature-measuring radiometers are in wide service.

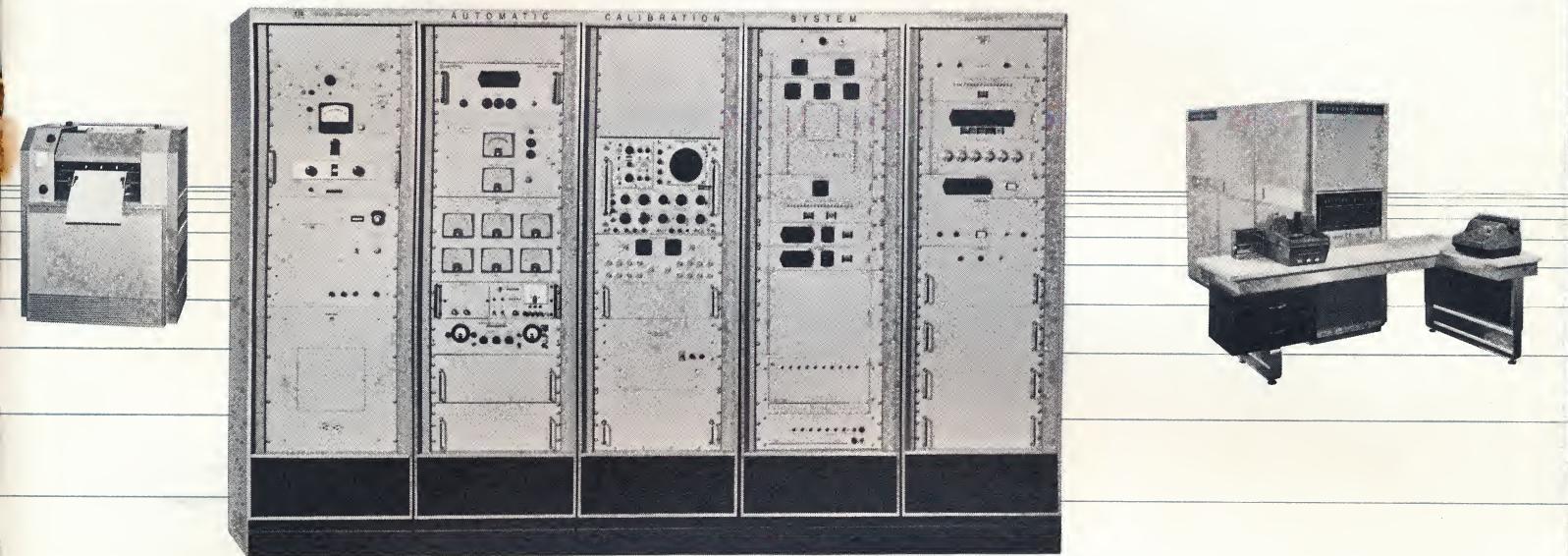
Radiometry provides valuable assistance to industry through on-line non-destructive quality control techniques. Incipient product failure is detected by measurement of localized temperature abnormalities. A fast-scan radiometer that performs this function is Infrared Industries' Infrascan® capable of recording thermal maps of objects as large as 3,000 sq. cm. in seconds.

Temperature mapping of the human body is an important diagnostic concept for the medical profession. Fast-scan radiometers (Thermoscan®) designed to detect and measure minute skin temperature differences as small as 0.2°C. were pioneered by IRI. Subsequent clinical research with these instruments has established a relationship between abnormal skin temperatures and certain diseases. The availability of Thermoscan® to medical research groups has led to growing acceptance of this diagnostic technique.

The possibilities of radiometric surveillance in space for defense and for basic research have been widely publicized. Radiometric apparatus for the military and space agencies has been and continues to be an area of prime strength at Infrared Industries, Inc.



The most sophisticated electronic



Electro-optical system is no better than its calibration — its readiness to accurately resolve optical targets. Such systems, whether spaceborne payloads, airborne experiments or ground station equipment, must have a calibrated point of departure in order to make meaningful radiometric measurements.

Infrared Industries, Inc.'s PACE 1000 series payload calibration equipment — illustrated — was conceived and produced to answer this need.

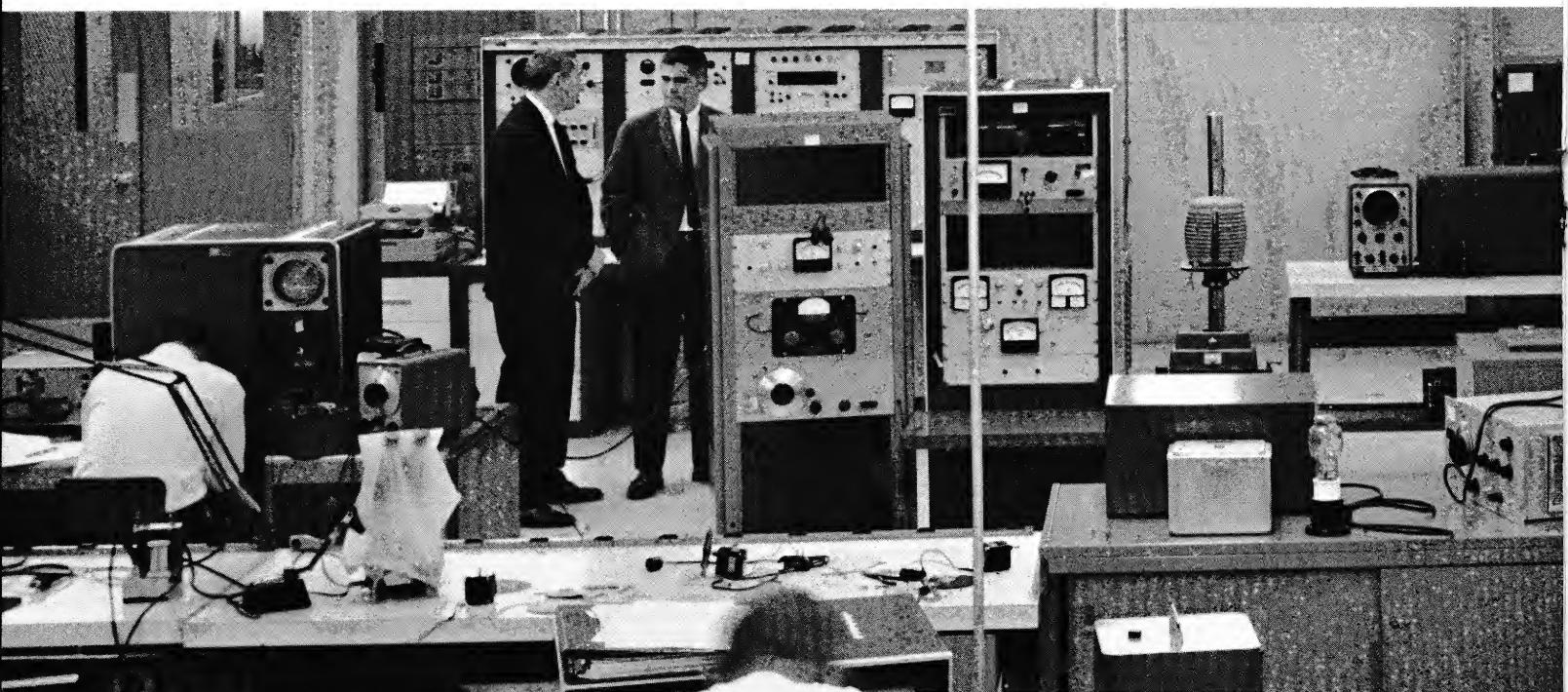
To show more than eight tons of high precision optics, mechanics and electronics in action, we will trace the energy path for the illustrated system from the simulated energy source to the computer's printed output for a single channel or parameter (a process actually occurring simultaneously in hundreds of channels).

The system controls and directs the beam, with a sighting accuracy of five arc seconds, in a space environment chamber. This beam emanates from a simulated star, as small as two arc seconds in diameter, to a payload under test on a rotary index table. The "star" (radian energy from a high temperature blackbody), focused at infinity, radiates from a small aperture in the focal plane of a parabolic reflecting collimator.

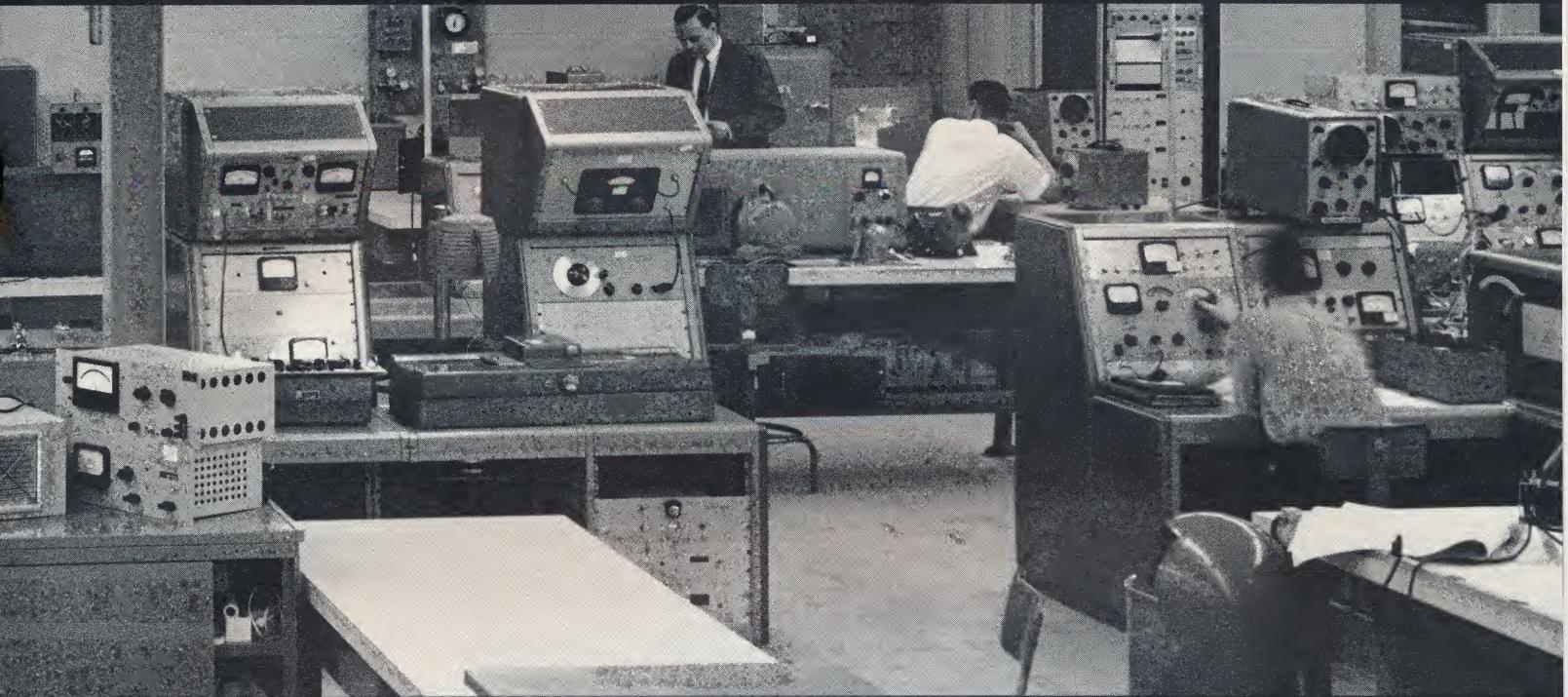
The 18-inch beam of radiant energy emerging from the collimating system is then directed into the payload by a 25-inch plane mirror, servo-controlled by the computer. The device under test converts the radiant energy to analog signals which are fed into a data conversion unit in the five-rack electronic control center, the interface between a high speed digital computer and the system electro-optics.

The control center routes the program commands to the servos of the calibration equipment, as well as stimulating the payload. IRI digital logic compares the measured parameters of the optical systems and the measured response of the test specimen, reading its telemetry output. These data are converted into a digital format for entry into the computer.

The computer compares the signal with an expected value and derives a quantity printed out as alpha-numeric data, which has immediate utility to the Test Director.



This PACE electro-optical calibration system, produced by IRI for MIT's Lincoln Laboratory, provides ground check-out and calibration of an airborne optical apparatus package including tracking cameras, cinespectrographs, and two-color radiometers.



System calibration is dependent on the calibration of its components. Meaningful radiometric measurements, whose values correlate with standards accepted by the scientific community, begin with the study of radiometric measurement parameters and with the calibration of primary sensor components—detectors, filters and optics.

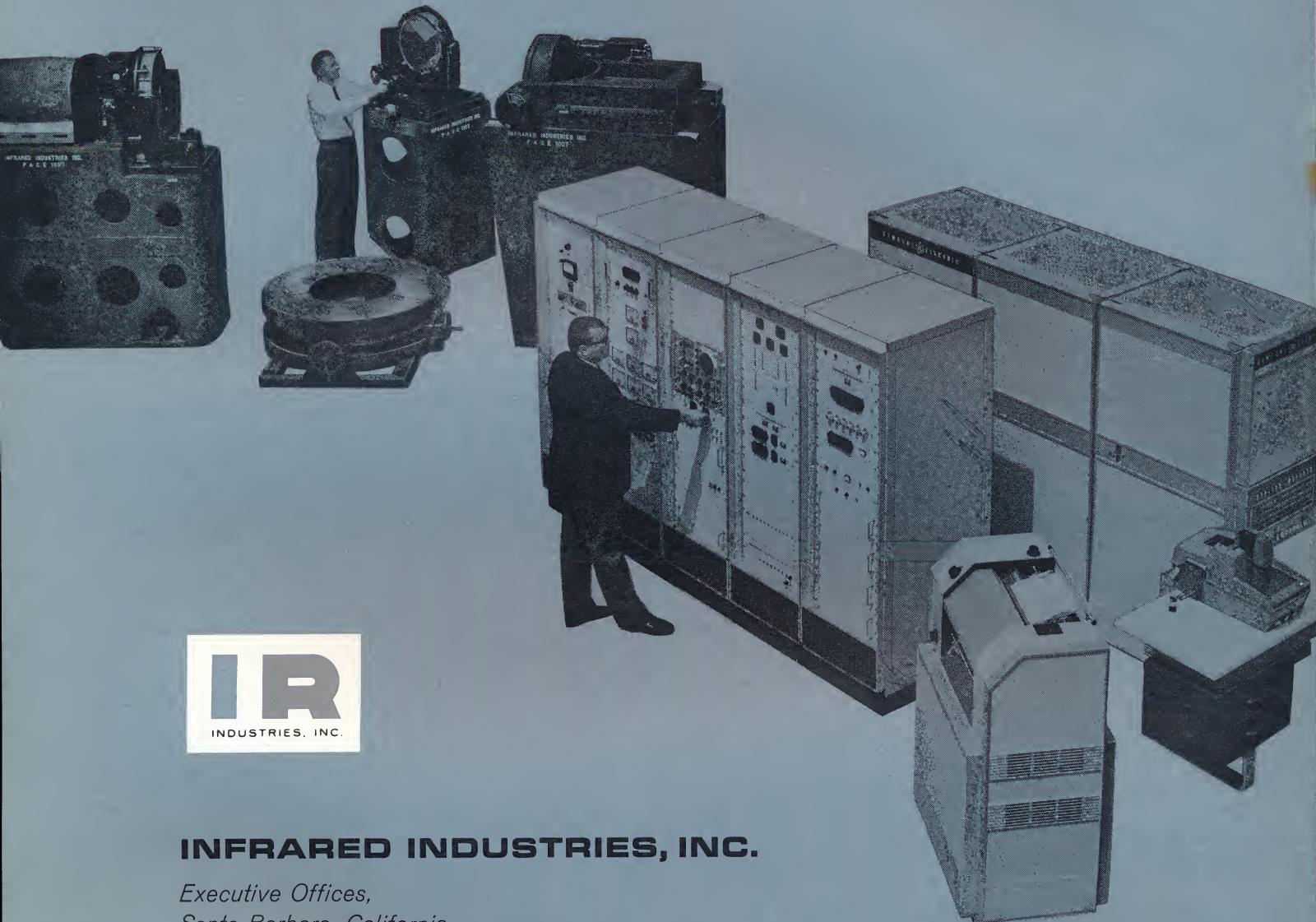
In the laboratory, partly shown, is an unduplicated concentration of electro-optical calibration systems designed and produced by Infrared Industries, Inc. for just this purpose.

The detection of optical energy and conversion to electrical signals with acceptable accuracy often demands the recovery of nanovolt level signals in the presence of noise; these must be furnished as non-ambiguous displays.

In order to achieve this, Infrared Industries, Inc. makes use of its engineering talents in measurement analysis, low noise electronics, multiplexing, cryogenics and thermo-electric cooling, target simulation, collimation, and digital data processing techniques.

While all of these systems were designed and built by Infrared Industries, Inc. to augment its own manufacturing and design control of radiometric sensors, production versions are in service in all major U.S. civilian and military agencies dealing with the infrared portion of the spectrum.

World-wide acceptance of IRI electro-optical system capability is evidenced by the use of our calibration equipments in Sweden, England, Germany, France, Italy, Israel, Japan, Canada and Australia.



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